Description

MASTER SPINDLE FOR TAPPING MACHINE

[1] The present invention relates, in general, to a master spindle for a tapping machine which can tap a female thread in a workpiece at high speed and with high precision, and, more particularly, to a master spindle for a tapping machine in which a single chuck support member is used, an umbrella- shaped chip cover or a fluctuation correcting cap is selectively fitted around the chuck support member, the chuck support member is defined with a tap separation hole for easy separation of a tap from a chuck, and tapped holes are defined in a bushing nut threadedly coupled to a spindle bolt.

Background Art

[2] Referring to FIG. 1, in a conventional master spindle 1 for a tapping machine, a tap 3 is detachably mounted to a chuck 5 which is mounted to an upper chuck support member 7. The upper chuck support member 7 is detachably locked to a lower support member 9 which is mounted to a spindle bolt 11. A bushing nut 13 is locked to the spindle bolt 11 and is positioned below the lower support member 9. Therefore, the spindle bolt 11 can be raised and lowered while being rotated relative to the bushing nut 13 fastened to a jig 15. The lower end of the spindle bolt 11 is connected to a universal joint (or a cable) (not shown) to receive power.

Disclosure of Invention

Technical Problem

[3]

[4] However, in the conventional master spindle 1 for a tapping machine, since the upper chuck support member 7 and the lower support member 9 are bolted to each other so that only the lower support member 9 and the spindle bolt 11 need be replaced with new ones when the spindle bolt 11 is broken, problems always occur due to non-concentricity between the upper chuck support member 7 and the lower support member 9. Also, due to the fact that the upper chuck support member 7 and the lower support member 9 are bolted to each other, the length 'h' of an entire support structure including the upper chuck support member 7 and the lower support member 9 increases. In this regard, while a defect is caused in that the tap 3 fluctuates when tapping a workpiece, means for preventing the fluctuation of the tap 3 has not been disclosed so far in the art.

[5] Further, in the conventional master spindle 1 for a tapping machine, as can be readily seen from FIG. 2, when tapping is conducted in a vertical direction, chip particles 17 are likely to be introduced into the chuck 5, whereby the tap 3 may not be

easily separated from the chuck 5 due to the presence of the chip particles 17. Also, while conducting tapping work in the vertical direction, the chip particles 17 are likely to enter a gap between the bushing nut 3 and the spindle bolt 11, whereby the screw threads of the spindle bolt 11 and the bushing nut 13 can be crushed.

[6] In addition, in the conventional master spindle 1 for a tapping machine, as can be readily seen from FIG. 3, due to the fact that a flange portion 13a of the bushing nut 13 is defined with only two mounting holes 13b, the jig 15 must be located under the flange portion 13a of the bushing nut 13 as shown in FIG. 2. Therefore, in case that the jig 15 must be located over the flange portion 13a of the bushing nut 13, since the bushing nut 13 cannot be fastened to the jig 15, it is impossible to implement the tapping work.

Technical Solution

[7]

[8] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a master spindle for a tapping machine in which a single chuck support member for supporting a chuck is used to decrease the length of a chuck support structure and solve the drawbacks resulting from non-concentricity of the chuck support structure.

[9] Another object of the present invention is to provide a master spindle for a tapping machine in which an umbrella-shaped chip cover is fitted around the lower end of a chuck support member to prevent chip particles from entering a gap between a bushing nut and a spindle bolt and avoid breakage of screw threads of the bushing nut and the spindle bolt.

[10] A further object of the present invention is to provide a master spindle for a tapping machine in which a fluctuation correcting cap fitted around a chuck support member is coupled to a bushing nut by bolts so that, when a spindle bolt threadedly coupled to the bushing nut is rotated relative to the bushing nut, the chuck support member connected integrally to the spindle bolt can be raised and lowered, without fluctuating, on the circumferential inner surface of the fluctuation correcting cap, and so that the fluctuation correcting cap can prevent chip particles from entering a gap between the bushing nut and the spindle bolt.

[11] Yet another object of the present invention is to provide a master spindle for a tapping machine in which a chuck support member is defined with a tap separation hole for easy separation of a tap from a chuck so that, even when chip particles are introduced into the chuck while tapping is implemented in a vertical direction, since it is possible to push the lower end of the tap out of the chuck by a lever inserted through the tap separation hole, the tap can be reliably separated from the chuck as the occasion demands.

[12] Still another object of the present invention is to provide a master spindle for a tapping machine in which auxiliary mounting holes are defined in a flange portion of a bushing nut so that the bushing nut can be mounted to a jig irrespective of the position of the jig.

Advantageous Effects

[13]

[14] As apparent from the above description, the master spindle for a tapping machine according to the present invention provides advantages in that, since a chuck support member has integral upper and lower ends, drawbacks due to non-concentricity of a chuck support structure in the conventional master spindle can be eliminated, and the length of the entire chuck support structure can be decreased, whereby the fluctuation of the master spindle during tapping is lessened and the precision of tapping work is improved.

[15] Also, in the master spindle for a tapping machine according to the present invention, due to the presence of an umbrella-shaped chip cover, it is possible to prevent chip particles from entering the gap between a bushing nut and a spindle bolt and avoid the breakage of screw threads of the bushing nut and the spindle bolt.

[16] Further, in the master spindle for a tapping machine according to the present invention, by the fact that the chuck support member is defined with a tap separation hole for easy separation of a tap from a chuck, even when chip particles are introduced into the chuck while tapping work is implemented in a vertical direction, it is possible to push the lower end of the tap out of the chuck by a lever inserted through the tap separation hole, whereby the tap can be reliably separated from the chuck as the occasion demands.

[17] Moreover, in the master spindle for a tapping machine according to the present invention, because tapped holes are defined in a flange portion of the bushing nut, the bushing nut can be mounted to a jig irrespective of the position of the jig.

[18] Furthermore, in the master spindle for a tapping machine according to the present invention, due to the fact that a fluctuation correcting cap can lessen the fluctuation of a spindle body, even when the screw threads of the bushing nut and the spindle bolt are abraded, the tapping work can be reliably implemented. Also, it is possible to extend the service lives of the bushing nut and the spindle bolt and prevent chip particles generated during tapping from entering the gap between the bushing nut and the spindle bolt.

[19] Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Description of Drawings

[20]

[21] The above objects, and other features and advantages of the present invention will become more apparent after a reading of the following detailed description when taken in conjunction with the drawings, in which:

[22] FIG. 1 is a half sectional view illustrating a conventional master spindle for a tapping machine;

[23] FIG. 2 is a half sectional view illustrating the master spindle of FIG. 1 in a state in which tapping is implemented in a vertical direction;

[24] FIG. 3 is a perspective view independently illustrating the bushing nut shown in FIGs. 1 and 2;

[25] FIG. 4 is a half sectional view illustrating a master spindle for a tapping machine in accordance with an embodiment of the present invention;

[26] FIG. 5 is a half sectional view illustrating the master spindle of FIG. 4 in a state in which tapping is implemented in a vertical direction;

[27] FIG. 6 is a half sectional view illustrating the master spindle according to the present invention, with a fluctuation correcting cap fitted around a chuck support member;

[28] FIG. 7 is a half sectional view independently illustrating the fluctuation correcting cap;

[29] FIG. 8 is a perspective view illustrating a bushing nut; and

[30] FIG. 9 is a half sectional view illustrating the master spindle with the bushing nut mounted to a jig placed on a flange portion of the bushing nut.

Best Mode

[31]

[32] Reference will now be made in greater detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

[33] Referring to FIG. 4, a master spindle 50 for a tapping machine in accordance with an embodiment of the present invention comprises a chuck 53 having a tap 51 detachably mounted thereto; a chuck support member 55 having the chuck 53 mounted thereto; a spindle bolt 57 fastened to the chuck support member 55 at an upper end thereof; and a bushing nut 59 threadedly coupled to the spindle bolt 57 and positioned below the chuck support member 55.

[34] The chuck support member 55 has an upper end to which the chuck 53 is mounted and a lower end to which the spindle bolt 57 is fastened. The upper and lower ends of

the chuck support member 55 are integrally formed with each other. By this fact, the strength of the screw threads of the spindle bolt 57 can be improved, and, as will be described later in detail, it is possible to prevent chip particles 100 from entering the gap between the spindle bolt 57 and the bushing nut 59. As a consequence, because the spindle bolt 57 can be used semi-permanently, it is not necessary to employ two separate support members as in the conventional art.

[35] Also, due to the fact that the chuck support member 55 has integral upper and lower ends, the drawbacks provoked due to non-concentricity of a chuck support structure in the conventional master spindle can be overcome, and the length 'S' of the entire chuck support structure can be decreased, whereby the fluctuation of the master spindle 50 during tapping is lessened and the precision of tapping work is improved.

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[37] Referring to FIG. 5, an umbrella-shaped chip cover 61 is provided to the lower end of the chuck support member 55. The chip cover 61 prevents chip particles 100 which are generated from a workpiece (not shown), from entering the space between the spindle bolt 57 and the bushing nut 59, even when tapping work is implemented in a vertical direction, so that it is possible to prevent the screw threads of the spindle bolt 57 and the bushing nut 59 from being crushed.

[38] Referring to FIG. 6, in a more developed form, in order to prevent the chip particles 100 from entering the space between the spindle bolt 57 and the bushing nut 59 and to prevent the tap 51 from fluctuating, the chuck support member 55 is provided with a fluctuation correcting cap 70.

[39] The fluctuation correcting cap 70 is defined with an opening 77 into which the chuck support member 55 is fitted so that a circumferential outer surface of the chuck support member 55 is brought into tight contact with a circumferential inner surface 79 of the fluctuation correcting cap 70. The fluctuation correcting cap 70 has a flange portion 75 which is coupled to the bushing nut 59 by locking bolts 81.

[40] Consequently, when the spindle bolt 57 is rotated relative to the bushing nut 59 which is fastened to a jig 91, the chuck support member 55 which is integrally coupled to the spindle bolt 57 is brought into tight contact with the circumferential inner surface 79 of the fluctuation correcting cap 70 and can be raised and lowered without fluctuating relative to the fluctuation correcting cap 70 fastened to the bushing nut 59. Also, the fluctuation correcting cap 70 functions to prevent the chip particles 100 from entering the space between the spindle bolt 57 and the bushing nut 59.

[41] Referring to FIG. 7, the fluctuation correcting cap 70 has a cylindrical configuration similar to the chuck support member 55. An O-ring 71 is fitted in the circumferential inner surface 79 of the fluctuation correcting cap 70 adjacent to the upper end of the fluctuation correcting cap 70. An oil inlet hole 73 is defined through the fluctuation

correcting cap 70 and communicates with the opening 77.

[42] he O-ring 71 serves to occupy a gap between the chuck support member 55 and the fluctuation correcting cap 70, so that, when the chuck support member 55 is raised and lowered relative to the fluctuation correcting cap 70, the fluctuation of the chuck support member 55 can be further lessened.

[43] The oil which flows into the fluctuation correcting cap 70 through the oil inlet hole 75 reduces friction when the chuck support member 55 is rotated relative to the fluctuation correcting cap 70.

[44] Due to the presence of the fluctuation correcting cap 70 constructed as mentioned above, even when the screw threads of the spindle bolt 57 and the bushing nut 59 are crushed, since the chuck support member 55 slides in the fluctuation correcting cap 70 without fluctuating, the tap 51 is prevented from fluctuating, whereby the tapping work can be reliably implemented and the chip particles 100 generated during implementation of the tapping work can be prevented from entering the space between the spindle bolt 57 and the bushing nut 59.

[45] Referring to FIGs. 4 and 5 again, the chuck support member 55 is defined below the chuck 53, with a tap separation hole 63 for easy separation of the tap 51 from the chuck 53. Hence, when the tapping work is implemented in the vertical direction, if the chip particles 100 are introduced into the chuck 53 and impede easy separation of the tap 51 from the chuck 53, by inserting a lever (not shown) or the like into the tap separation hole 63 to push the lower end of the tap 51 out of the chuck 53, the tap 51 can be easily separated from the chuck 53.

[46] Referring to FIG. 8, the bushing nut 59 is defined with mounting holes 59b and auxiliary mounting holes 59c. Therefore, as can be readily seen from FIG. 5, in the case in which the jig 91 is located under a flange portion 59a of the bushing nut 59, bolts 83 can pass through the mounting holes 59b and be locked into auxiliary mounting holes 93b of the jig 91 to fasten the bushing nut 59 to the jig 91. At this time, as shown in FIG. 6, as the locking bolts 81 are locked into the mounting holes 95b, the fluctuation correcting cap 70 is fastened to the bushing nut 59. Further, in the case in which the jig 91 is located over the flange portion 59a of the bushing nut 59, as bolts 87 pass through mounting holes 93c of the jig 91 and are locked into the auxiliary mounting holes 59c defined in the flange portion 59a, the bushing nut 59 can be fastened to the jig 91. At this time, as the locking bolts 81 are locked into the auxiliary mounting holes 59c, the fluctuation correcting cap 70 is fastened to the bushing nut 59. Hence, the mounting holes 59b and the auxiliary mounting holes 59c of the bushing nut 59 allow the bushing nut 59 to be fastened to the jig 91 irrespective of the location of the jig 91.